MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

Permitting and Compliance Division
Water Protection Bureau
P.O. Box 200901
Helena, MT 59620-0901

Permit Fact Sheet
Montana Ground Water Pollution Control System (MGWPCS)

Permittee:	Valley Grove Sewer District
Permit No.:	MTX000112
Receiving Water:	Class I Ground Water
Facility Information	
Name:	Valley Grove Wastewater Treatment Plant
Mailing Address:	702 Bridger Drive # 48 Bozeman, MT 59715
Contact:	Carl Lehrkind /Terry Hooge
Phone:	406-388-5273/406-586-9168
Fee Information	
Number of Outfalls:	1
Outfall - Type:	001 Subsurface Drainfield

I. Permit Status

This is a renewal permit for an existing wastewater treatment system that is part of a subdivision located adjacent to Hyalite Creek between Belgrade and Bozeman, MT. In May 1, 2001 this facility was issued a Montana Ground Water Pollution Control System (MGWPCS) permit. The permit expired in April 30, 2006. The 2001 permit authorized discharge of residential strength wastewater from the subdivision to ground water.

The Department received the renewal application and supporting documents on October 14, 2006. The application was determined to be deficient October 31, 2006. The Department received a response to the deficiency letter on January 12, 2007. A complete permit application was received and permit application was deemed complete on February 14, 2006.

II. Facility Information

A. Facility Description

The Valley Grove Subdivision (VGS) is currently discharging an average volume of approximately 23,000 gallons per day of wastewater from a 123 lot subdivision. Effluent from each building is conveyed via an eight (8) inch main to a lift station with grit chamber. Effluent will then be pumped to a 6,000 gallon distribution tank. From this point effluent is pumped to 1 of four SBR's. Each SBR is comprised of two (2) 6,000 gallon treatment tanks and a clarifier. From this point effluent is conveyed to a 6,000 gallon feed tank. Sludge from the SBR is circulated to four (4) 6,000 gallon sludge tanks for further treatment or to be removed from the system and disposed of offsite. From the feed tank effluent is directed through ultra violet disinfection to a 6,000 dose tank and ultimately discharged to an eight (8) zone drainfield. The wastewater treatment system has the capacity to discharge a daily maximum of 43,000 gpd (design capacity) to the groundwater. The drainfield will receive all the discharge from the dose tank. There are no flow meters in this system, flow is monitored via does counts. Due to low flows to the treatment system VGS is currently only using three (3) of the SBR's.

The previous permit established the existing drainfield as outfall 001. Outfall 001 is situated in T1, R5, southwest ¼ of Section 20, or 45° 44'06" N latitude and 111° 08'17" W longitude. The drainfield is located on the hydraulically down gradient side of the VGS. However, there are approximately ten (10) lots in the existing VGS mixing zone.

B. Effluent Characteristics

The wastewater treatment system is an existing system therefore some effluent samples have been collected and analyzed as part of existing permit conditions. Effluent characteristics as reported on Discharge Monitoring Reports (DMR's) are listed in table 1.

III. Proposed Technology Based Effluent Limits

The existing permit did not develop technology based effluent limits. The existing permit limit was developed under the premise that VGS wastewater treatment system is a conventional system. It was given a nondegradation nitrate value not to exceed 5.0 mg/L. This value is given to systems that discharge domestic sewage effluent from a conventional septic system. The Department is not proposing a technology based effluent limit for the new permit cycle.

Table 1: Effluent Characteristics [(1)] for the POR 12/31/02 to 12/31/06.

Parameter	Location	Units	Previous Permit Limit	Maximum Value	Minimum Value	Average Value	Number of Samples
Flow, Daily Average	Effluent	gpd	(3)	24,488	11,227	19,730	17
Biochemical Oxygen Demand (BOD_5)	Influent	mg/L	(3)	(2)	(2)	(2)	(2)
	Effluent	mg/L	(3)	(2)	(2)	(2)	(2)
	Effluent	% removal	(3)	(2)	(2)	(2)	(2)
	Effluent	lbs/day	(3)	(2)	(2)	(2)	(2)
Total Suspended Solids (TSS)	Influent	mg/L	(3)	(2)	(2)	(2)	(2)
	Effluent	mg/L	(3)	16.0	3.0	10.27	17
	Effluent	% removal	(3)	(2)	(2)	(2)	(2)
	Effluent	lbs/day	(3)	(2)	(2)	(2)	(2)
Escherichia coli (E. coli)	Effluent	No./100ml	(3)	(2)	(2)	(2)	(2)
pH	Effluent	s.u.	(3)	(2)	(2)	(2)	(2)
Specific Conductance	Effluent	µS/cm	(3)	(2)	(2)	(2)	(2)
Chloride	Effluent	mg/L	(3)	352	3.0	167.22	17
Total Ammonia	Effluent	mg/L	(3)	1.4	0.1	0.18	17
Kjeldahl Nitrogen, as N	Effluent	mg/L	(3)	(2)	(2)	(2)	(2)
Nitrate + Nitrite, as N	Effluent	mg/L	(3)	10.3	0.3	3.89	17
Total Inorganic Nitrogen	Influent	mg/L	(3)	(2)	(2)	(2)	(2)
		lbs/day	(3)	(2)	(2)	(2)	(2)
Total Inorganic Nitrogen	Effluent	mg/L	30.0	(2)	(2)	(2)	(2)
		lbs/day	(3)	(2)	(2)	(2)	(2)
Total Phosphorus	Effluent	mg/L	(3)	(2)	(2)	(2)	(2)
		lbs/day	(3)	(2)	(2)	(2)	(2)
Oil and Grease	Effluent	mg/L	(3)	(2)	(2)	(2)	(2)

Footnotes:

(1) Conventional and nonconventional pollutants only, table does not include toxics.

(2) Data not available: no samples collected for this parameter.

(3) No limit in previous permit.

IV. Water-Quality Based Effluent Limits

A. Receiving Water

The permittee submitted ground water analytical data from wells around the existing subdivision. All well data used in development of permit conditions comes from wells that are located within one mile of the discharge site.

Ground water quality sampling was conducted from three wells (MW-1, MW-2 and MW-3) all located down gradient of the discharge. These wells are domestic supply wells located either within or in close proximity to the mixing zone. The sampling event occurred on July 11, 2006 reported average Nitrate plus Nitrite (as N) concentration from the three wells is 1.63 mg/L, Total Nitrogen (TN) is 1.73 mg/L, Total Phosphorous (TP) is 0.1 mg/L, Total Dissolved Solids (TDS) is 286.6 mg/L and all Fecal Coliform samples were reported as less than one organism per 100 ml. Additional ground water quality data for monitoring wells MW-1, MW-2 and MW-3 can be found in Appendix A.

One ground water quality sample was collected up gradient of the proposed discharge site. This well was sampled most recently September 29, 2006. This sampling event yielded a nitrate plus nitrite (as N) concentration of 1.3 mg/L and conductivity of 443 µmhos/cm.

The receiving water for Outfall 001 is Class I groundwater as defined by ARM 17.30.1006 (1)(a). The quality of Class I groundwater must be maintained so that these waters are suitable for public and private water supplies, culinary and food processing, irrigation, commercial and industrial purposes, drinking water for livestock and wildlife. Human health standards listed in DEQ-7 (February 2006) apply to concentrations of dissolved substances in Class I ground waters with a specific conductance of less than 1,000 µmhos/cm [ARM 17.30.1006(1)(a)(i)].

The average hydraulic conductivity of the aquifer is 750 ft/day. This estimate is derived from a well test conducted on a source well on the VGS site. The well test was conducted during construction of the subdivision. This value is representative of the sands and gravels that comprise the first aquifer.

The hydraulic gradient in the shallow ground water was reported as 0.005 ft/ft, estimated from monitoring wells MW-1, MW-3 and PWS-3. Hydraulic gradient was established during the 2006 ground water investigation. Findings of the 2006 ground water investigation are concurrent with findings of the USGS geohydrologic study conducted by Slagel (1995).

The National Resources Conservation Service (NRCS) indicates that soils in the vicinity of the wastewater treatment system are primarily Hyalite (0-8 inches Loam, 8-17 inches Clay Loam, 17-26 inches Extremely Cobbly Sandy Loam and 26-60 inches Very Cobbly Loamy Sand), Hyalite of the Beaverton complex (0-4 inches Cobbly Loam, 4-14 inches Very Cobbly Clay Loam, 14-60 inches Extremely Cobbly Loamy Sand), Beaverton Cobbly Clay (0-4 inches Cobbly Clay Loam, 4-14 inches Very Cobbly Clay Loam, 14-60 inches Extremely Gravelly Sand) and that these are the dominant soil types for this site (http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx).

Based on proximity, the nearest surface water is Mc Donald Creek approximately 600 ft east of the existing discharge location and across gradient. Mc Donald Creek runs parallel to the wastewater treatment system and ultimately down gradient of the system. Therefore based on the direction of ground water flow, the nearest surface water to Outfalls 001is also Mc Donald Creek approximately 1,800 feet downgradient. The ground water flow direction in the vicinity of the drainfield is approximately N28°E based on the 2006 ground water assessment.

B. Basis for Water Quality based Effluent Limits

ARM 17.30.506 (1) states that a discharge to state waters shall not cause a violation of a water quality standard outside a Department authorized mixing zone. Ground water quality standards for nitrogen apply at the down-gradient mixing zone boundary in the unconfined aquifer.

Water quality limitations must be established in permits to control all pollutant or pollutant parameters that are or may be discharged at a level which will cause, have reasonable potential to cause or contribute to an excursion above any state water quality standard. The permittee must comply with the permit developed by the Department in accordance with the Montana Numeric Water Quality Standards included in Circular DEQ-7 (February 2006) and protection of beneficial uses (ARM 17.30.1006). Ground water quality standards may be exceeded within a Department authorized mixing zone (ARM 17.30.1005), provided that all existing and future beneficial uses of state waters are protected [ARM 17.30.506 (1)].

C. Nitrate

Class I ground water is considered high quality water and is subject to Montana's Nondegradation Policy 17.30 subchapter 7. The wastewater system is considered a new source as pursuant to ARM 17.30.702 (18)(a). Total nitrogen is the sum of inorganic nitrogen and organic nitrogen concentration (nitrate + nitrite as N (NO_3+NO_2-N) plus ammonia and organic nitrogen as N). The Department assumes all the nitrogen discharged to the drainfield in the effluent is converted to nitrate as nitrogen.

The existing permit Total Inorganic Nitrogen (TIN) limit was based on a dilution calculation with a assumed effluent concentration of 30 mg/L TIN, a design capacity of 43,000 gpd, a ground water flow volume of 27,521 ft^3/day, a ambient nitrate nitrite concentration of 1.94 mg/L, a recharge volume from precipitation of 145 ft^3/day and a concentration of Nitrate plus Nitrite in the precipitation of 1.0 mg/L.

While the design capacity of the VGS has remained constant, reassessment of the ground water flow direction significantly changed the area used to calculate ground water flow volume. The area used to calculate the volume of ground water is based on the size and shape of the drainfield measured perpendicular to ground water flow. The recalculated groundwater flow is approximately 39,195 ft^3/day. The recently measured average ambient Nitrate plus Nitrite concentration in ground water is 2.08 mg/L. The Department no longer uses precipitation volume or concentration in Nitrogen effluent limit calculations. The Department also no longer uses TIN as a permit limit.

Based on the nondegradation trigger value that was used to develop existing permit effluent limits, the applicable ground water standard is a nitrate concentration of 5.0 mg/L at the end of the proposed standard mixing zone.

Total nitrogen is the sum of inorganic nitrogen and organic nitrogen concentration (nitrate + nitrite as N (NO_3+NO_2-N) plus ammonia and organic nitrogen as N). The Department assumes all the nitrogen discharged to the drainfield in the effluent is converted to nitrate as nitrogen. The allowable discharge concentration is derived from the mass balance water quality equation, which considers dilution and background concentration of the receiving water (EPA, 2000).

$$C_2 = \frac{C_3(Q_1 + Q_2) - C_1 Q_1}{Q_2}$$

C_1= ambient ground water (background) concentration, mg/L
C_2 = allowable discharge concentration, mg/*L*
C_3 = ground water concentration limit for pollutant (from Circular DEQ-7 February 2006 or other appropriate water quality standard) at the end of the mixing zone.
Q_1 = ground water volume (ft^3 / day)
Q_2 = maximum flow of discharge (design capacity of system in ft^3 / day)

The volume of ground water that will mix with the discharge (Q_s) is estimated using Darcy's equation: $Q_1 = K\ I\ A$.

Where: Q_1 = ground water flow volume (ft^3/day)
K = hydraulic conductivity (ft/day)
I = hydraulic gradient (ft/ft)
A = cross-sectional area (ft^2) of flow at the down-gradient boundary of a standard 500-foot mixing zone.

$$(Q_{1\text{-}001}) = (750\ ft/day)(0.00536\ ft/ft)(9{,}750 ft^2)$$
$$Q_{1\text{-}001} = 39{,}195\ ft^3/day$$

The design capacity of the entire wastewater disposal system is 43,000 gpd, or 5,749 ft^3/day. Hydraulic conductivity (K) of the alluvium is estimated at 750 feet per day (ft/d). The gradient was calculated based on well data from wells surrounding the site, at 0.00536 ft/ft. The area (A) is calculated by the width of the source perpendicular to the ground water flow direction, times a standard mixing zone depth in the groundwater of 15 feet. The applicable water quality standard of 5.0 mg/L must be met at the end of the mixing zone. The permit application indicated a Nitrate plus Nitrite concentration of 2.08 mg/L. Therefore a concentration of nitrate (as N) of 2.08 mg/L was used in calculating the allowable nitrogen concentration at the end of the mixing zone. It is assumed that the entire total nitrogen load in the seepage effluent converts to nitrate and enters the ground water.

$$C_2 = \frac{5.0 \text{ mg/L } (39{,}195 \text{ ft}^3\text{/day} + 5{,}749 \text{ ft}^3\text{/day}) - (2.08 \text{ mg/L}) (39{,}195 \text{ ft}^3\text{/day})}{(5{,}749 \text{ ft}^3\text{/day})}$$

$$= 24.9 \text{ mg/L}$$

The projected daily maximum concentration of the total nitrogen in the effluent discharged to groundwater must not exceed 24.9 mg/L at Outfall 001. The Department assumes an additional 7% nitrogen removal occurs within the drainfield providing a final total nitrogen concentration discharged to ground water of 23.2 mg/L. These effluent limits ensure the nitrate plus nitrite (as N) concentration at the end of the ground water mixing zones are at or below the nondegradation significance criterion of 5.0 mg/L.

D. Phosphorus

A phosphorous limit was not developed in the existing permit. A total phosphorus limitation will be imposed to ensure that the quality of the effluent meets the nondegradation limit prior to discharge into ground water [ARM 17.30.715(1)(e)]. The effluent limits do not include a concentration limit for phosphorus because of the method used to determine compliance with the 50-year breakthrough criteria. Phosphorous breakthrough analysis calculations are mass based, therefore the effluent limit will be a mass based discharge limit. Phosphorus is removed mainly through soil adsorption processes, which vary based on soil composition. The 50-year breakthrough nondegradation criterion is based on the amount of soil available to adsorb the phosphorus between the discharge point, the closest surface water and the average load of phosphorus from the wastewater source.

The phosphorus concentration of typical residential wastewater ranges from 6.0 mg/L to 12.0 mg/L (EPA 2002). The Department considers 10.6 mg/L an average concentration of typical residential wastewater (DEQ-Taskforce 1997). The estimated load to ground water based on a design capacity of 43,000 gpd and an expected phosphorous concentration in the effluent of 10.6 mg/L is approximately 3.80 lbs per day.

Using the distance to surface water (Mc Donald Creek) approximately 1,800 feet northeast of the drainfields the breakthrough time for phosphorus is 91.8 years. This is based on a phosphorus load of 153.2 lb/year or 0.42 lbs/day. This breakthrough time is considered nonsignificant pursuant to Montana's Nondegradation criteria [ARM 17.30.715(1)(e)].

A phosphorous breakthrough would occur in 50 years (the level of significant degradation) at an effluent concentration of 13.2 mg/l and load of 4.74 lbs/day. Therefore the effluent limit for the Total Phosphorous load discharged to the drainfields shall not exceed 4.74 lbs /day or 1,726.5 lbs/year for Outfall 001. The water quality based effluent limits for each outfall are presented on Table 2.

E. Escherichia Coli

A wastewater treatment system that is appropriately sited and operating properly should remove most if not all of the pathogenic bacterial indicators within 2 to 3 feet of the drainfields infiltrative surface (USEPA, 2002). An Escherichia Coli (E coli) limit has not been established in this permit due to the following site-specific criteria:

- The drainfield is pressured-dosed, which minimizes saturated conditions and therefore maximizes the die-off rate in natural sediments.
- Estimated concentration of E coli bacteria (between 10^6-10^8), and SWIS performance for removal of E Coli bacteria is estimated to be about 99 % (EPA 2002).
- The wastewater treatment system incorporates disinfection of effluent.
- The permittee is required to meet the E Coli ground water standard of less the 1 organisms/100 ml in ground water.

The systematic dosing of the drainfield and the soil matrix of the drainfield provide natural disinfection, which will enable the DEQ-7 human health standard of <1 organism/100 ml to be achieved in the groundwater. Pathogen transport research indicates a 3-log decrease in pathogens for every meter of horizontal movement through the vadose zone and a 6-log decrease in pathogen transport for every 20 m in vertical transport through the saturated zone (Woessner, 1998). The proposed system discharges the effluent about 3 m above the ground water; additional treatment will occur prior to reaching the water table. A 3-log removal in the vadose zone indicates less than 1 colony per 100 ml within 3-feet of the discharge. The existing system incorporates disinfection in the wastewater treatment system. A Mixing Zone will not be granted for pathogens.

The proposed water quality and nondegradation effluent limits for outfall 001 presented in Table 3.

Table 3. Water-Quality Based Effluent and Nondegradation Limits Outfall 001

Parameter	Concentration (mg/L) Daily Maximum (1)	90 Day Average Load (2) (lbs/ per day)
Total Nitrogen as N	23.2	NA
Total Phosphorus as P	NA	4.74

(1) See definitions, Part I.A of the permit
(2) load calculation: lb/d = (mg/L) x flow (gpd) x 8.34 x 10^{-6}

F. Mixing Zone

The drainfields discharge to ground water and qualify for a standard mixing zone [ARM 17.30.517 (1)(b)]. The permittee discharges all wastewater from the facility to Outfall 001 and was previously granted a standard 500-foot ground water mixing zone for the drainfield in a N28°E direction. Groundwater flow direction was established via data collected from monitoring wells on-site. The shape of the mixing zone is determined from the drainfield dimensions, ground water table elevation, and groundwater flow direction, information of which was submitted with the permit application.

The previous permit granted a ground water mixing zone for the individual parameter of nitrate. This mixing zone will be employed in this permit. The permittee must comply with the ground water mixing zone rules pursuant to ARM 17.30 Subchapter 5. Ground water standards for nitrate may be exceeded within the mixing zone provided that all existing and future beneficial uses of the state waters are protected (ARM 17.30.1005).

The concentration of Nitrate (N) must not exceed 5.0 mg/l on the down gradient boundary of the mixing zone [ARM 17.30.715(1)(d)(iii)]. The permittee will be required to comply with the all applicable ground water quality standards.

V. Final Effluent Limits

The proposed final effluent limitations for Outfall 001 are summarized in Table 4 and are based on water quality and nondegradation significance water quality criteria and existing permit limits discussed in previous sections. Monitoring data indicates that the discharge is not causing or contributing to a violation of water quality standards. The final proposed effluent limit for nitrogen is based on the permit limit established in during the last permit cycle. The current permit uses a numeric effluent limit of 30 mg/L for total inorganic nitrogen (TIN), which is the combination of Nitrate, Nitrite and Ammonia. The Department uses total nitrogen (TN) to account for the organic nitrogen in effluent which is able to convert to nitrate in the subsurface (the TIN does not account for the organic fraction of nitrogen in the effluent). The limit is being changed in the renewal permit from 30 mg/L TIN to 30 mg/L TN.

As the existing permit does not have a phosphorous limit, and the Department can establish a phosphorous limit pursuant to ARM 17.30.715 (1)(e). The effluent limit for phosphorus is a water quality based nondegradation significance criteria. The water quality based effluent load limit considers the assimilative capacity of the soil system to estimate the maximum load of phosphorus discharged to the groundwater without exceeding the 50-year breakthrough. The 90 day average loads limit will provide protection of water quality.

The permittee submitted technical information indicating a design capacity of 43,000 gpd. This value is used in determination of phosphorous load limits and for determining the allowable nitrogen concentration at the end of the mixing zone. The flow limit for outfalls 001 shall not exceed the design capacity of 43,000 gpd.

Table 4. Numeric Effluent Limits for Outfall 001

Parameter	Concentration (mg/L) Daily Maximum [(1)]	90 Day Average Load[(2)] (lbs/ per day)
Total Nitrogen as N	30	NA
Total Phosphorus as P	NA	4.74[(2)]

(1) See definitions, Part I.A of the permit
(2) 90 day average load calculation: lb/d = (mg/L) x flow (gpd) x 8.34 x 10^{-6}
NA = Not Applicable

VI. Monitoring Requirements

Effluent monitoring is essential to ensure the effective treatment and consistency of the wastewater discharged from the facility. Effluent limits are established to protect the ground water from a change in water quality that would cause degradation [ARM 17.30.715] or limit a beneficial use [ARM 17.30.1006(1)(a)]. Samples or measurements shall be representative of the volume and nature of the monitored discharge. Water quality monitoring of the effluent shall occur from the dosing tank prior to discharge into the drainfields. The permittee shall monitor the flow of the effluent continuously and report the gallons per day based on the daily maximum.

The effluent flow measurement method shall be either by flow meter and recorder or a totalizing flow meter; dose counts or pump run-times will not be accepted. Flow measurement equipment must have the ability to report a daily maximum flow. To ensure that the Total phosphorous load is calculated correctly, an accurate maximum daily flow must be measured. Maximum daily flow shall be measured when required sampling is conducted (flow measurement must correspond to sample collection to calculate an accurate load). The effluent flow rate is to be a measured and reported as a maximum daily flow.

The permittee shall monitor the effluent for the constituents in Table 5 at the frequency and with the type of measurement indicated. If no discharge occurs during the entire monitoring period, it shall be stated in a Discharge Monitoring Report that no discharge occurred.

Table 5. Outfall 001 Parameters Monitored in the Effluent Prior to Discharge to the Drainfield

Parameter	Frequency	Sample Type[(1)]
Effluent Flow Rate, gpd[(2) (3)]	Daily[(1)]	Continuous[(1)]
Biological Oxygen Demand (BOD_5), mg/L	Quarterly	Composite
Total Kjeldahl Nitrogen (TKN), mg/L	Quarterly	Composite
NO_3+NO_2 as N, mg/L	Quarterly	Composite
Ammonia, as N, mg/L	Quarterly	Composite
Total Phosphorus (as P), mg/L	Quarterly	Composite
Total Suspended Solids (TSS) mg/L	Quarterly	Composite
Total Nitrogen (as N), mg/L	Quarterly	Calculated
Total Nitrogen (as N), lb/d	Quarterly	Calculated
Total Phosphorus (as P), lb/d	Quarterly	Calculated
Chloride, mg/L	Quarterly	Composite

(1) See definitions, Part I.A of the permit
(2) If no discharge occurs during the reporting period, "no discharge" shall be recorded on the DMR report form
(3) Permittee is to report the daily maximum and 90 day average

A. Ground Water Monitoring

Ground water monitoring will be required to continue in this permit due to the following site-specific criteria:

- This area is experiencing rapid growth with high density development.
- Proximity of the water table to the surface (15-20 ft below the surface).
- The shallow aquifer is a coarse grained alluvial aquifer with a relatively high hydraulic conductivity (750 ft/day).
- The need to distinguish the effects to ground water of the discharging wastewater treatment system.

The permittee is required to monitor the ground water on the downgradient edges of the standard 500-foot mixing zone. As stipulated in the existing permit current ground water monitoring is conducted in 3 monitoring wells. All of these wells are domestic source wells and exist in the mixing zone, or in close proximity to it. Based on a site map submitted by the permittee the existing monitoring wells are approximately 200 feet from the terminus of the drainfield and within the standard mixing zone. Therefore one monitoring well shall be installed outside of and on the downgradient edge (northeast side) of the mixing zone. This well shall be identified as MW-4. This well shall serve as a monitoring point for the standard groundwater mixing zone. This shall be screened from the top of the high water table to 15 feet below the low water table. The permittee will conduct quarterly monitoring for the parameters listed in Table 6.

Table 6. Monitoring Parameters for Monitoring Wells: MW-4

Parameter	Frequency	Sample Type (1)
Static Water Level (SWL) (feet below the casing top)	Quarterly	Instantaneous
Specific Conductance, µmhos/cm	Quarterly	Grab
Chloride, mg/L	Quarterly	Grab
Escherichia Coli (Organisms/100 m*l*)	Quarterly	Grab
Total Ammonia, as N, mg/L	Quarterly	Grab
NO_3+NO_2 as N, mg/L	Quarterly	Grab

(1) See definitions, Part I.A of this permit

VII. Nonsignificance Determination

During the development of the existing permit the Department determined that the discharge constitutes a new source and is subject to Montana Nondegradation Policy (75-5-303, MCA; ARM 17.30.702(16)). The Department also determined this discharge would not cause degradation of state waters.

VIII. Special Conditions/Compliance Schedules

a) Effluent Flow Measurement

The existing permit for the VGS does not require effluent flow monitoring. To ensure that the Total phosphorous load is calculated correctly, an accurate maximum daily flow must be measured. The Department requires that samples or measurements be representative of the

volume and nature of the monitored discharge. Therefore the permittee shall submit to the Department the method of effluent flow monitoring. Effluent flow shall be monitored following treatment in the SBR's and prior to discharge into the drainfield. The measurement method shall be either by recorder or a totalizing flow meter dose counts or pump run-times will not be accepted. The permittee shall monitor the flow of the effluent continuously. The permittee shall install the above mentioned flow monitoring equipment within three (3) years of the effective date of the permit.

b) Monitoring Well Installation

Existing ground water quality monitoring points consist of domestic source wells and exist in the mixing zone, or in close proximity to it. Based on a site map submitted by the permittee the existing monitoring wells are approximately 200 feet from the terminus of the drainfield and within the standard mixing zone. Within 90 days of the effective date of the permit the permittee shall submit to the Department for approval a plan for compliance ground water monitoring well installation as well as a brief summary of a monitoring, sampling and analysis plan for monitoring wells installed onsite. The plan is to include the location, conceptual design and construction methods of the planned ground water monitoring wells, and the monitoring, sampling and analysis methods that will be used to meet the monitoring required in the Permit. The well shall be located in the centerline of the terminus of the mixing zone for outfall 001.

Prior to issuance of the final permit the permittee shall submit to the Department a brief report or letter documenting the results of the monitoring well installation including the final location of the installed monitoring well, construction details for the well and a report on ground water quality in the from the well. Ground water quality analysis shall include those parameters listed in Table 6. Ground water quality monitoring shall begin in the first calendar quarter following installation of the well and continue though the duration of the permit.

IX. Information Source

In the development of the effluent limitations, monitoring requirements and special conditions for the draft permit, the following information sources were used to establish the basis of the draft permit and are hereby referenced:

ARM Title 17, Chapter 30, Sub-chapter 5 - Mixing Zones in Surface and Ground Water, September 1999.

ARM Title 17, Chapter 30, Sub-chapter 7 - Nondegradation of Water Quality, March 2000.

ARM Title 17, Chapter 30, Sub-chapter 10 - Montana Ground Water Pollution Control System (MGWPCS), March 2002

Environmental Protection Agency, U.S. EPA NPDES Permit Writers Manual, December 1996

Environmental Protection Agency, U.S. EPA Wastewater Technology Fact Sheet, Package Plants, EPA 832-F-00-016 September 2000.

Environmental Protection Agency, Design Manual: Onsite Wastewater Treatment System Manual. EPA 625/R-00/008, 2002.

Fetter, C.W., Applied Hydrogeology., 1988

Regensburger, E. Nutrient-Reducing Wastewater Treatment System Designation Form. Montana Department of Environmental Quality. 2004

Woessner, W., Thomas, Troy., Ball, Pat and DeBorde, Dan C., (April 1998), Virus Transport in the Capture Zone of a Well Penetrating a High Hydraulic Conductivity Aquifer Containing a Preferential Flow Zone: Challenges to Natural Disinfection. , University of Montana., Missoula, Montana.

United States Department of Agriculture, Natural Resource Conversation Service, http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx .

Slagle, S.E., 1995, Geohydrologic Conditions and Land use in the Gallatin Valley, Southwestern Montana, 1992-93: U.S. Geological Survey Water-Resources Investigations Report 95-4034,

Prepared By: Louis Volpe June 20, 2007

Appendix A

Ground Water Quality Down Gradient of VGS Drainfield

Parameter	Units	Minimum Value	Maximum Value	Average Value	Number of samples
MW-1					
Chloride	mg/L	24	3	12.2	16
Fecal Coliform	#/100 ml	11,100	0	700.44	16
Nitrate plus Nitrite	mg/L	7	0.84	2.51	16
Total Ammonia	mg/L	0.13	0.01	0.09	16
Specific Conductance	µmhos/cm	593	310	493.81	16
Water level	Ft.	20	9.5	139.5	11
MW-2					
Chloride	mg/L	22.5	0.84	10.05	16
Fecal Coliform	#/100 ml	11,100	0	710.25	16
Nitrate plus Nitrite	mg/L	3.5	0.2	1.45	16
Total Ammonia	mg/L	0.5	0.01	0.13	16
Specific Conductance	µmhos/cm	525	177	458.69	16
Water level	Ft.	20	9.5	13.95	11
MW-3					
Chloride	mg/L	21.5	2	11.23	15
Fecal Coliform	#/100 ml	11,100	0	742	15
Nitrate plus Nitrite	mg/L	3	0.1	1.76	15
Total Ammonia	mg/L	0.18	0.1	0.11	15
Specific Conductance	µmhos/cm	570	188	484.8	15
Water level	Ft.	20	9.5	13.95	12